

A New Species of *Lepidochitona* (Mollusca: Polyplacophora) from El Salvador

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Abstract. *Lepidochitona salvadorensis* sp. nov. from El Salvador is the third species of the genus described for the Panamic Province. The species previously known were *Lepidochitona beanii* Carpenter, 1857 and *L. corteziana* Clark 2000. *L. salvadorensis* differs from *L. beanii* in having longer hyaline spicules, a smooth tegmentum, rounder lateral margins of the intermediate valves and smaller marginal spicules. *L. corteziana* differs from both in the lack of large hyaline spicules on the girdle.

INTRODUCTION

In July 2002 a group of zoologists from El Salvador and Puerto Rico studied the polyplacophoran fauna of the rocky coasts of El Salvador (García-Ríos et al., 2003). Eleven species of Polyplacophora from shallow water were collected, of which seven species were new reports, including *Lepidochitona beanii* Carpenter, 1857 and two specimens of an undescribed species of *Lepidochitona*. In December 2003 a new visit to the previous stations allowed the collection of additional material, enabling the description of the new species.

The genus *Lepidochitona* Gray, 1821 is represented in the Panamic Province by two species, *L. beanii* and *L. corteziana*. This description adds a new species of this genus to the fauna of El Salvador.

MATERIALS AND METHODS

Thirty-three specimens of *L. salvadorensis* and four specimens of *L. beanii* were collected in the sublittoral, at depths of 0.5–2 m, at low tide. All animals were found under small rocks partially buried in the sand. They were preserved flat in 70% ethanol.

Measurements of whole animals (including girdle) were made using a caliper under the dissection microscope. Four specimens selected for detailed studies of the valves, radula, and girdle were prepared according to the methods described by Bullock (1985). Soft parts of the chitons were dissolved in heated 2N KOH solution. The valves and radula were cleaned further using ultrasound for one or two minutes. After cleaning, these structures were rinsed with distilled water and then stored in 70% ethanol.

Cleaned hard parts selected for study with scanning electron microscopy (SEM), were air dried, mounted on aluminum specimen stubs using carbon tape and coated with gold using a sputtering machine.

SYSTEMATICS

Higher classification follows Kaas & Van Belle (1985). Types are placed in the Zoological State Collection Munich (ZSM), Munich, Germany; Museo de Historia Natural de El Salvador (MUHNES), Central America; Academy of Natural Sciences, Philadelphia (ANSP); United States National Museum of Natural History, Smithsonian Institution, (USNM).

Class POLYPLACOPHORA Gray, 1821

Order NEOLORICATA Bergenhayn, 1955

Suborder ISCHNOCHITONINA
Bergenhayn, 1930

Family ISCHNOCHITONIDAE Dall, 1889

Genus *Lepidochitona* Gray, 1821

Subgenus *Lepidochitona* s.s.

◦ *Lepidochitona* (*L.*) *salvadorensis*
García-Ríos, sp. nov.

(Figs. 1–10)

Holotype: ZSM Moll 20040210: one complete specimen (Figure 1), preserved flat in alcohol, 4.6 mm long, 2.7 mm wide, Los Cóbanos (13°31'40"N, 89°48'44"W), Sonsonate, El Salvador, sublittoral, 1 m depth at low tide, under stone partially buried in sand, 23 December 2003.

Other material examined: Paratype MUHNES 90-416, 4.4 mm long, 2.5 mm wide, with the same locality and collection data of holotype (Figure 2); paratype MUHNES 90-417, 6.1 mm long, 3.5 mm wide, Playa Maculís (13°09'30"N, 89°55'24"W), La Unión, El Salvador, (Figure 3); paratype ANSP A20089, 6.0 mm long, 3.8 mm wide, Playa Maculís, (same previous coordinates) (Figure 4); paratype USNM 1023580, 5.4 mm long, 3.0 mm wide,



Figure 1. *Lepidochitona salvadorensis* García-Ríos, sp. nov. Holotype, ZSM Moll 20040210, scale bar = 1 mm.

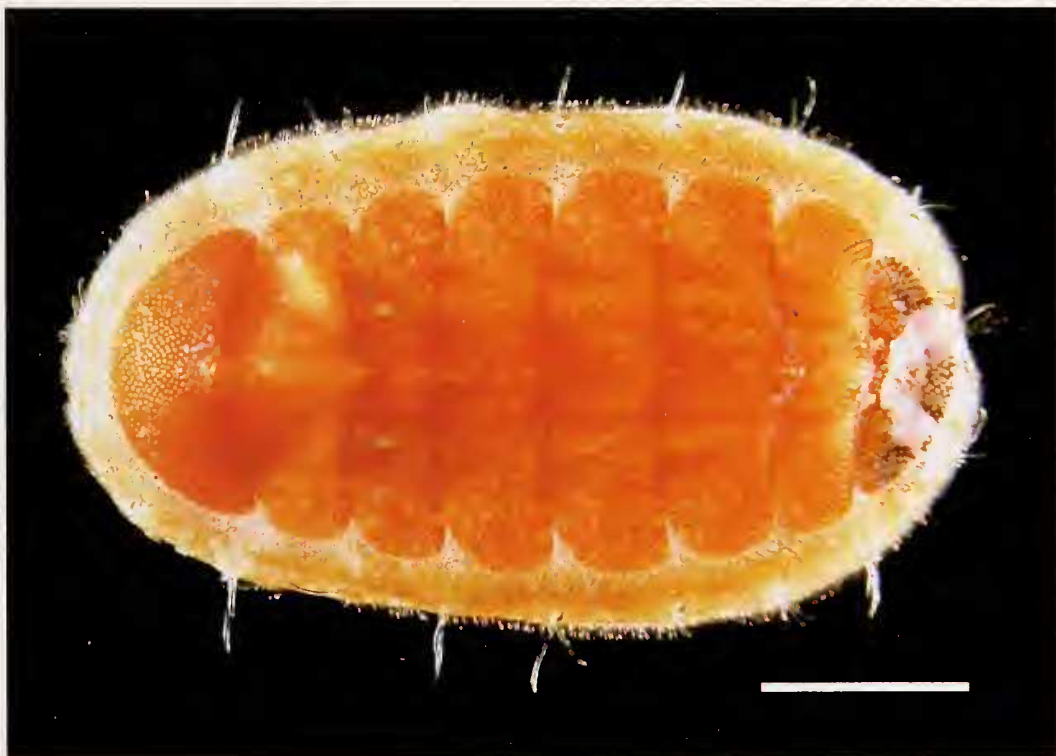


Figure 2. *Lepidochitona salvadorensis* García-Ríos, sp. nov., Paratype, MUHNES 90-416, scale bar = 1 mm.

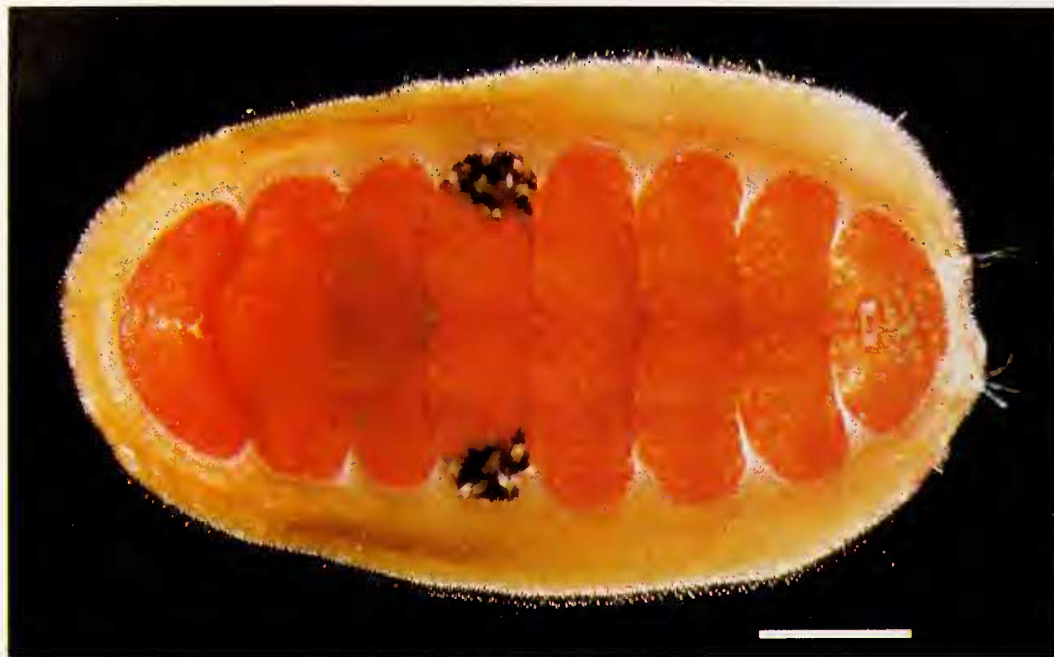


Figure 3. *Lepidochitona salvadorens* García-Ríos, sp. nov., Paratype, MUHNES 90-417, scale bar = 1 mm.

the previous locality (Figure 5); and others, not designated as paratypes, in the author's private collection. All the types and other material examined for this description were found under stones, 0.5–2 m depth, collected in December 2003 and preserved flat in alcohol. All the material came from the two locations mentioned.

Etymology: This species is named for the country, El Salvador, in which it was first discovered.

Diagnosis: Recognized by its small size, oval shape, and reddish color. Head valve semicircular, posterior margin V-shaped. Intermediate valves with convex anterior margin, rounded side margins, concave posterior margin at both sides of the protruding apex, lateral areas poorly defined. Tail valve is semicircular, smaller than the others, mucro at central position, concave postmucronal slope. The tegmentum is smooth. The girdle is wide, dorsally covered with minute bluntly pointed spicules and 20–21 tufts of long, curved hyaline needles.

DESCRIPTION

The species is small, up to 9.8 mm long, 6.5 mm broad, elongated oval, moderately elevated (dorsal elevation 0.37), carinated, girdle relatively broad. When alive, the color of the tegmentum and girdle is dark red, some with mottlings of white and brown marks. In alcohol the red color of the tegmentum changes from red to orange. The head valve always is reddish, sometimes with small white marks only in the posterior margin. The tail valve always has some white or brown marks in the postmucronal area (Figures 1–5).

The head valve is semicircular, its posterior margin is V-shaped (Figure 6A), some notched in the middle. Intermediate valves have convex anterior margin, side margins are rounded, their posterior margins are concave at both sides of the protruding apex, lateral areas are poorly defined or not defined at all (Figure 6B). Tail valve is semicircular, anterior margin almost straight in the center, with a 45° angle of both borders (Figure 6C), mucro at a central position, prominent, postmucronal slope is concave, stepped near the mucro (Figure 7). The tegmentum width size ratio of valve I:IV:VIII is 1:1.40:0.84 (N = 33). Frequently the tegmentum of the valve V is a little broader than on valve IV (mean of the differences is 0.04 mm).

Tegmentum smooth, without any granules or sculpture under magnification. The megalopores are uniformly distributed throughout the tegmentum, with a density of 1 per 930 μm^2 . There are 9 to 10 micropores for each megalopore.

Articulamentum white, translucent, apophyses broad, subtriangular with rounded apex, sinus length is about 25% of the intermediate valves' width and 15% of the tail valve tegmentum width. The insertion plates slit formula is: 8–9/1/7–11, slit rays present on all valves, teeth well defined, striated, eaves porous and narrow.

Girdle wide (average is 32% of the total width), reddish brown, dorsally covered with very small, juxtaposed, globulose, bluntly pointed spicules, up to 20–25 \times 5–7 μm (Figure 8), and long, smooth and curved hyaline needles mostly measuring 0.4–0.8 mm \times 25–30 μm , (largest frequently broken). Different sizes of hyaline needles are

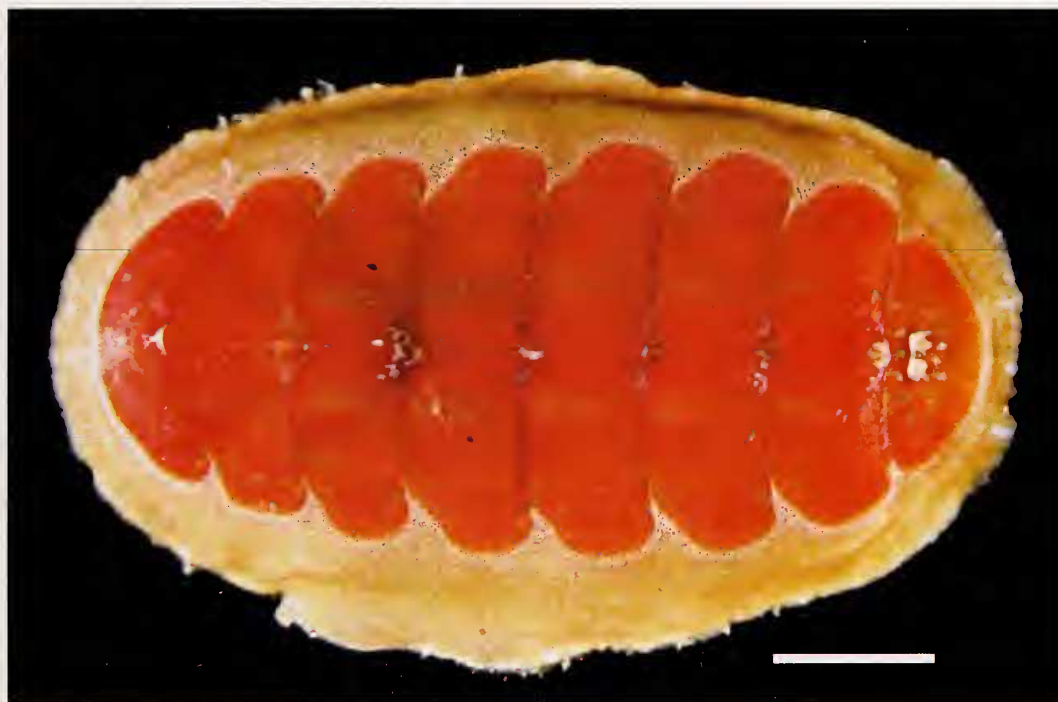


Figure 4. *Lepidochitona salvadorensis* García-Ríos, sp. nov., Paratype, ANSP A20089, scale bar = 1 mm.

interspersed and bunched in tufts of 2–6, almost 20–21 tufts: 4 near the head, 2–3 post tail plate and 14 aligned with the sutures (Figure 1). Some smaller spicules ($40\text{--}250 \times 15\text{--}20 \mu\text{m}$) are dispersed in the dorsal surface of

the girdle (Figure 8). Marginal spicules are elongate, straight, amber color, dorsal surface vaulted and grooved in two directions on the distal half (Figures 8 and 9A), ventral surface flat, without any sculpture; up to 55–65

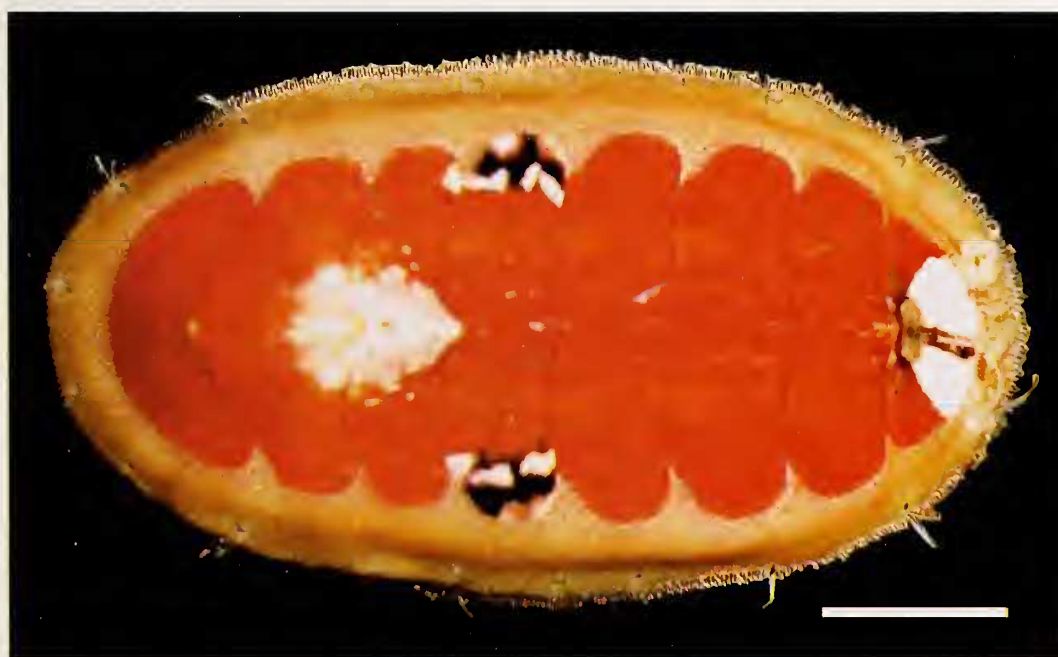


Figure 5. *Lepidochitona salvadorensis* García-Ríos, sp. nov., Paratype, USNM 1023580, scale bar = 1 mm.

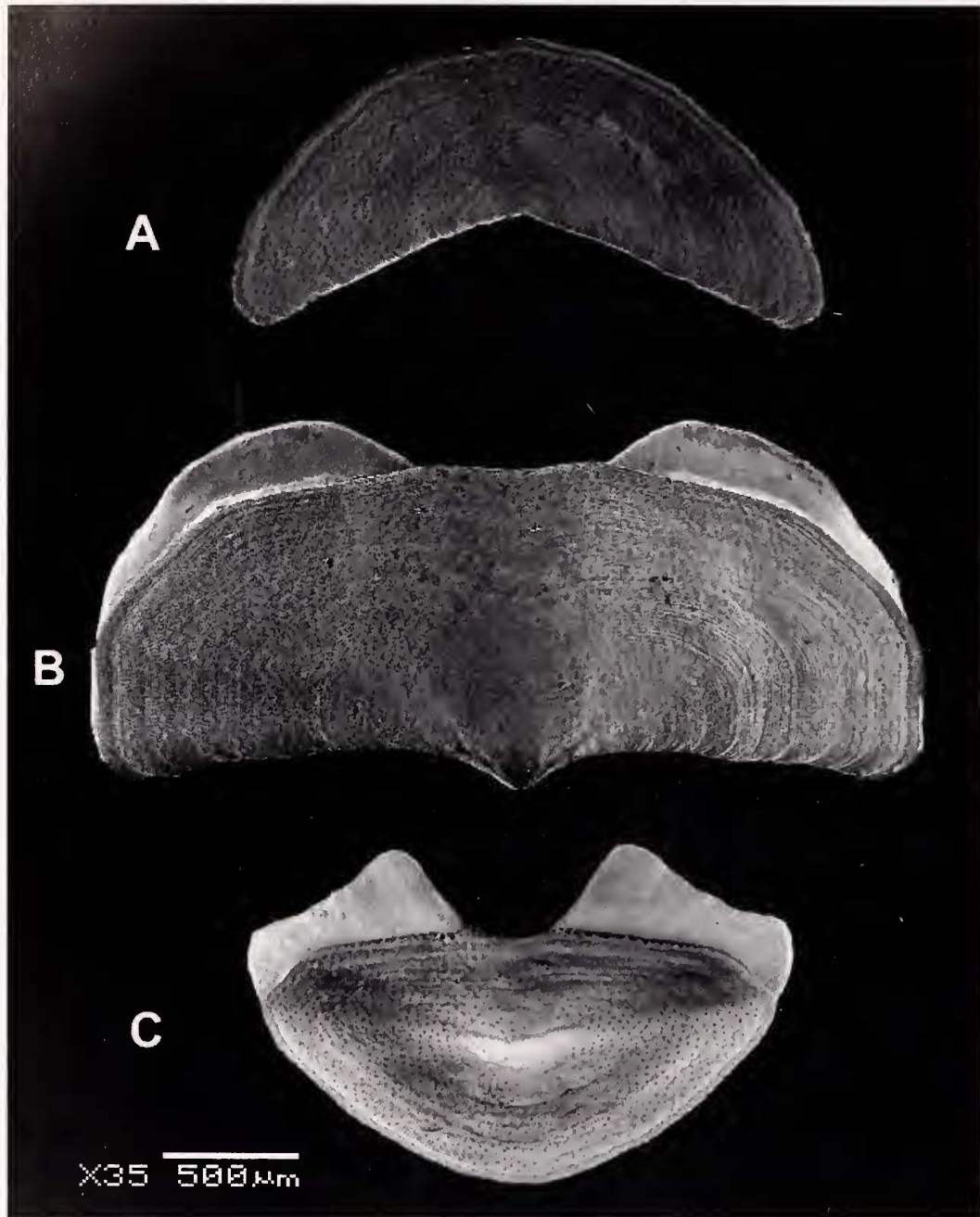


Figure 6. Scanning electron micrograph of *Lepidochitona salvadorensis* García-Ríos, sp. nov. (whole specimen 8.1 mm long, 4.7 mm wide, including girdle, #CIGR 2049): dorsal view of A, head valve; B, valve IV; C, tail valve.

$\times 10 \mu\text{m}$. Undersurface paved with translucent, imbricating, pointed scales, $40\text{--}45 \times 10\text{--}15 \mu\text{m}$ (Figure 9C); and a row of submarginal scales (between the marginal spicules and the ventral scales), less pointed, translucent, up to $80\text{--}100 \mu\text{m} \times 16 \mu\text{m}$ (Figure 9B).

Central tooth of the radula is twice as long as wide, with a well defined blade; major lateral tooth with a tri-

dentate cusp, central one a little wider and longer than the others (Figure 10).

The arrangement of the gills is holobranchial, with 14 pairs of gills (in 7 and 9 mm long specimens). The gills are abanal, with the size of the gills increasing posteriorly, with a free space between the two rows of gills and the anus, with a well defined pallial lappet.

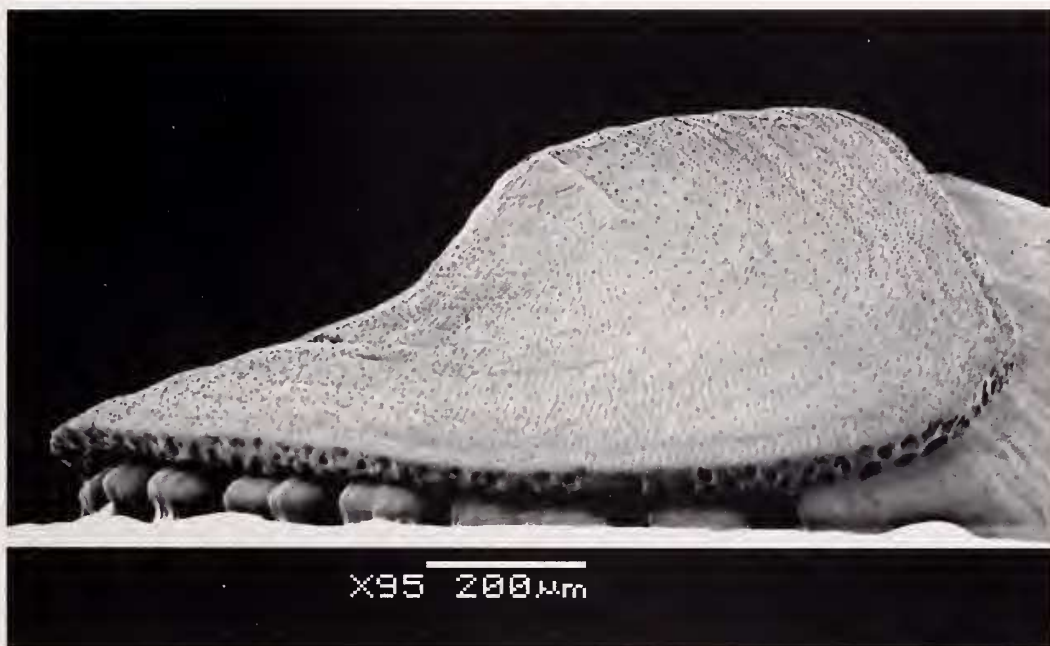


Figure 7. Scanning electron micrograph of *Lepidochitona salvadorensis* García-Ríos, sp. nov. (#CIGR 2049): lateral view of tail valve.

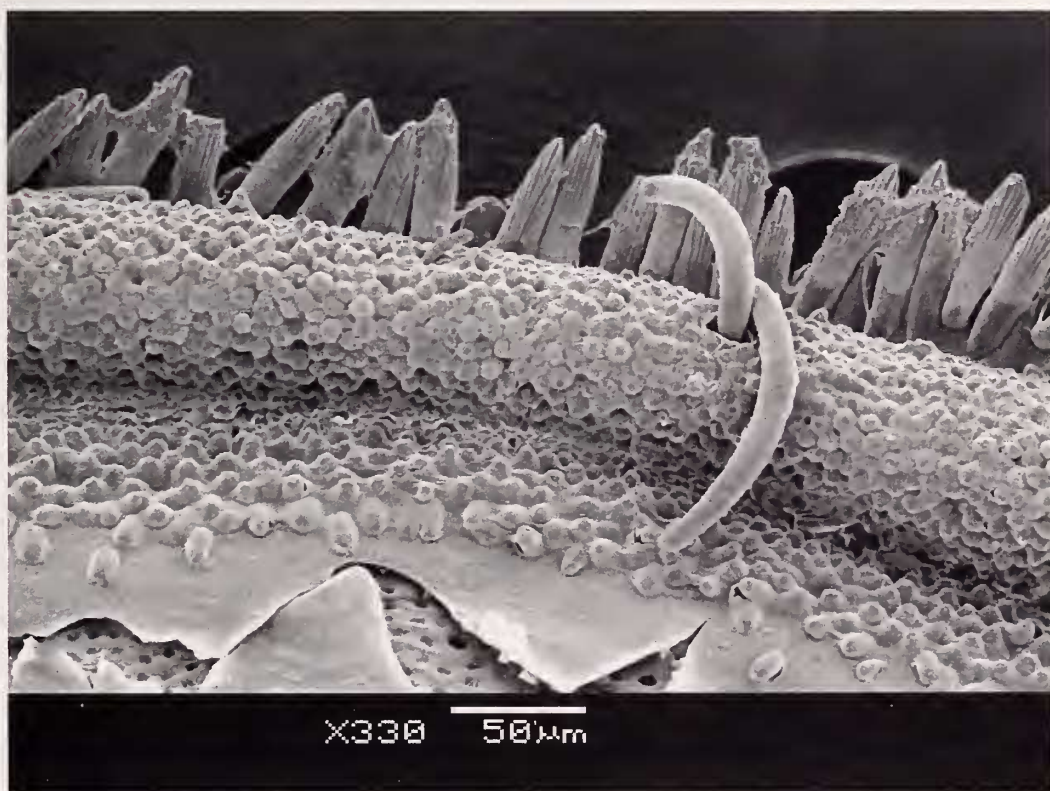


Figure 8. Scanning electron micrograph of *Lepidochitona salvadorensis* García-Ríos, sp. nov. (whole specimen 9.4 mm long, 5.7 mm wide, including girdle, #CIGR 2055): dorsal view of girdle.

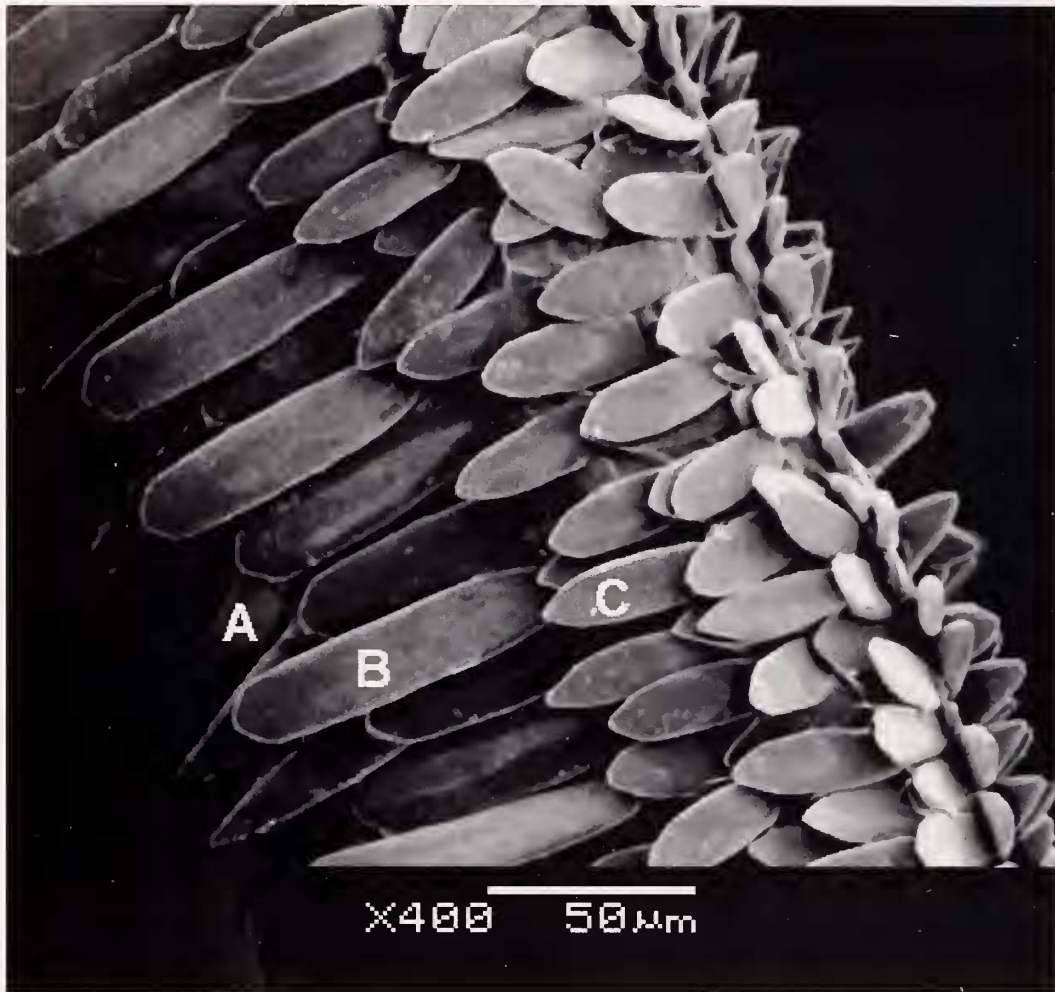


Figure 9. Scanning electron micrograph of *Lepidochitona salvadorensis* García-Ríos, sp. nov. (#CIGR 2055): ventral view of the girdle; A, marginal spicules; B, submarginal spicules; C, ventral spicules.

DISTRIBUTION

L. salvadorensis has been collected in two localities in El Salvador: Los Cóbanos, Sonsonate (13°31'40"N, 89°48'44"W) and Playa Maculís, La Unión (13°09'30"N, 89°55'24"W).

REMARKS

The new species always appear associated with crustose coralline algae (Corallinaceae: *Neogoniolithon* spp). The live chiton closely matches the color of the associated crustose alga, as illustrated in Littler & Littler (2000:71). The hyaline needles are frequently broken. The holotype has a fine calcareous overgrowth in the II, III and VIII plate.

DISCUSSION

Eernisse (2004) proposed three clades based on comparative biochemistry of the family Lepidochitonidae: one

clade groups the *Lepidochitona* from northern Europe, which remain under *Lepidochitona*, another clade groups the species from the northern Pacific under the genus *Cyanoplax*, and a third clade containing the Caribbean, Panamic and southern African species together with the genus *Nuttallina* (Eernisse does not suggest a generic classification for this clade). The genus designation for *L. salvadorensis* is based strictly on morphological characters, following the criteria of Kaas and Van Velle (1998). It was included on this genus due to the presence of hyaline spicules on the girdle. The genus *Mopalia* was not considered because the specimens have more than 8 slit in the head valve and the girdle is not hairy; neither does it belong to *Dendrochiton* because the girdle lacks corneous processes.

L. salvadorensis differs consistently from *L. beanii* Carpenter, 1857, the only previously known *Lepidochitona* species from El Salvador, by its possession of considerably longer hyaline spicules, a smooth tegmentum,

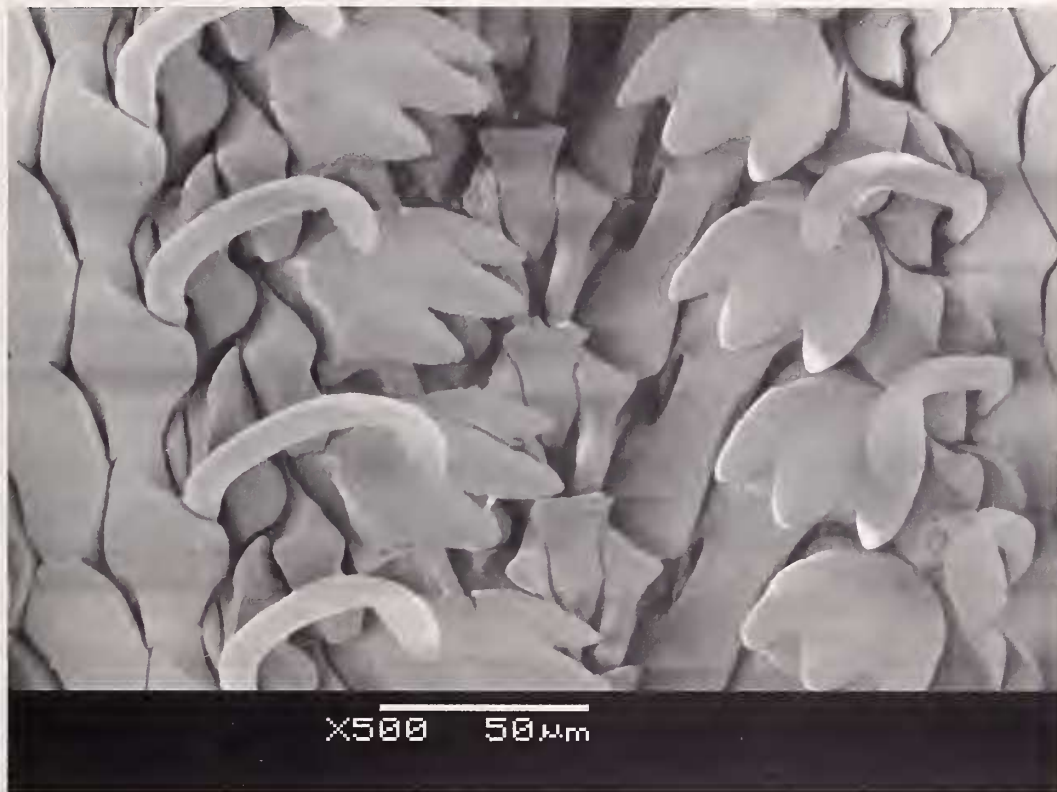


Figure 10. Scanning electron micrograph of *Lepidochitona salvadorensis* García-Ríos, sp. nov. (#CIGR 2049): radula.

rounder lateral margins of the intermediate valves and smaller marginal spicules. The microgranular surface of the tegmentum in *L. beanii* (Figure 11) stands out both in the original brief description (Carpenter, 1857, illustrated in Brann, 1966), as well as in the detailed and well illustrated description of Kaas & Van Belle (1985).

Other differences between both species are the wider girdle and the amber color of the marginal spicules in *L. salvadorensis*. The examination of the radulae of three specimens of *L. salvadorensis* did not show the much longer central cusp in the major lateral tooth as illustrated for *L. beanii* in Kaas & Van Belle (1985).

L. salvadorensis is similar in color and shape to *L. corteziana*, from the Gulf of California. The smaller size (to 3.5 mm) and lack of large spicules on the girdle (Clark, 2000) separate *L. corteziana* from the other two species. *L. corteziana* have shorter dorsal and ventral girdle elements, different slit formula (10-1-12) and different megapores to micropores ratio (1:2) in the tegmentum than *L. salvadorensis*.

L. salvadorensis tegmentum surface and the ratio of 10 micropores for each megapore is similar to the Caribbean *Lepidochitona liozonis* (Dall & Simpson, 1901) (but *L. liozonis* has mega and micropores density three times greater). Both species have similar color patterns and are generally associated with crustose red algae (García-Ríos,

2003). Clark (2000) mentioned a similar resemblance of his *L. corteziana* with the South African *L. turtoni* (Ashby, 1928) and the North Pacific *L. (Spongioradsia) alenitica* (Dall, 1878), all with coralline algal habitat.

L. salvadorensis is the same species that appears illustrated and described as *Lepidochitona* sp. in the guide to identification of the species of El Salvador (García-Ríos et al., 2003).

Acknowledgments. For their help and assistance in the field work, appreciation is here expressed to Migdalia Álvarez-Ruiz (University of Puerto Rico at Ponce), Carolina and Carlos Roberto Hasbún (Fundación Zoológica de El Salvador), Laura Martínez, Ana M. Rivera (Museo de Historia Natural, San Salvador, El Salvador), José E. Barraza (Ministerio de Medio Ambiente y Recursos Naturales, El Salvador).

I thank Enrico Schwabe, Bruno Anseeuw, Yves Terryn and Edgardo Ortiz for their valuable comments and for allowing me to use their collection of literature and specimens of *L. beanii* for comparison. The scanning electron microscope facilities were provided by the Department of Physics, UPR-Humacao and the Partnership to Integrate Research and Education in Materials (NSF-DMR-0353730). Facilities for obtaining microphotographs of the types were provided by the Advance Program (NSF SBE-0123654). The review of Dr. Douglas J. Eernisse provided many useful ideas and suggestions.

This research was partly supported by the Research Fund of the University of Puerto Rico at Humacao and by a contribution



Figure 11. Scanning electron micrograph of *Lepidochitona (L.) beanii* Carpenter, 1857 (whole specimen 3.6 mm long, 2.1 mm wide, including girdle, #CIGR 2076); valve IV.

of the Puerto Rico Alliance for Minority Participation (PR-AMP).

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